State of the Art (SOTA)
Manual for Bakery Ovens

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State of New Jersey
Department of Environmental Protection
Air Quality Permitting Program

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Manual for Bakery Ovens
Section 3.11

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3.11.i ABBREVIATIONS

ACT	Alternative Control Techniques
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
BAQEv	NJDEP Bureau of Air Quality Evaluation
DRE	Destruction or Removal Efficiency
LAER	Lowest Achievable Emission Rate
MACT	Maximum Achievable Control Technology
NJDEP	New Jersey Department of Environmental Protection
PPM	Parts Per Million
PSD	Prevention of Significant Deterioration
RACT	Reasonably Achievable Control Technology
SCAQMD	South Coast Air Quality Management District
SOTA	State of the Art
US EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

3.11 STATE OF THE ART MANUAL FOR BAKERY OVENS

3.11.1 Scope

This section of the State of the Art (SOTA) Manual defines SOTA performance levels for newly constructed, reconstructed, or modified bakery ovens and control apparatus as prescribed in N.J.A.C. 7:27-8 and 7:27-22.35. Catalytic oxidation has been the control of choice by more than 90 percent of American bakers for controlling volatile organic compounds (VOC) emissions from bakery ovens. SOTA emission standards are based upon currently available catalytic oxidation technology. Emissions from bakery ovens may include VOCs, particulate, and ammonia. VOC emissions may include hazardous air pollutants (HAPs). One such HAP, which the State of New Jersey considers to be a carcinogen as well, is acetaldehyde, which is usually emitted in small amounts when yeast leavened products are being baked.

3.11.2 SOTA Performance Levels

Capture efficiency for bakery ovens is considered 100 percent because the ovens operate under negative pressure. This means that all emissions are directed to the oven stacks. The emissions occurring at a temperature sufficient to volatilize VOCs are to be directed to the control device, if one is required.

A reduction of total VOCs (including HAPs) of at least 95 percent, or a one hour average VOC concentration of 20 parts per million volume (ppmv) dry as methane at 3 percent oxygen at the outlet, is SOTA for bakery ovens. This control efficiency shall be measured from the inlet to the outlet of the control device. A scheduled maintenance program, based upon good engineering practices, will be followed to ensure the efficiency of the air pollution control device is preserved.

SOTA for particulate is 0.020 grains per dry standard per cubic foot (one hour average) or less. SOTA for ammonia (NH_3) is no control, unless control is needed when this air contaminant causes odors beyond the property limits of the facility.

The use of innovative technologies to reduce bakery oven VOC emissions is encouraged by the NJDEP. Such technologies will be reviewed on a case by case basis.

3.11.3 Technical Basis

SOTA is a technology-based level. As the technology improves, and is proven to be technically and economically feasible, SOTA performance levels must be changed to reflect the improved technology.

SOTA levels are based on technical findings after discussions with control design engineers and control manufacturers. Additionally, US EPA's *Alternative Control Technology Document For Bakery Oven Emissions* (ACT) , the US EPA RACT/BACT/LAER Control Technologies Database, and US EPA's Control Technology Center were reviewed.

3.11.4 Recommended Review Schedule

The review schedule is every two years after the effective date of this manual. Review will be initiated on the review date. The review will be completed and any revisions to the manual published eighteen months after the review date. A review schedule of two years was selected for the following reasons:

- The development of alternative controls, while not yet substantiated as viable in fact, appear to be reaching the end of development and the beginning of pilot and full scale installation on bakery ovens.

- New technologies used in catalyst manufacturing have produced at least one low temperature catalyst for ethanol. A catalytic oxidizer with the new catalyst has been installed on a bakery oven and air tested. It controlled VOC emissions from the bakery oven by more than 98 percent with inlet temperatures less than 500 degrees Fahrenheit.

- States are becoming more innovative in their goal of meeting State Implementation Plan (SIP) requirements under the Clean Air Act Amendments of 1990. As a result, cost effective permitted requirements in nonattainment areas will continue to trend toward more control of VOC emissions.

3.11.5 References

Alternative Control Technology Document for Bakery Oven Emissions, U. S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, EPA 453/R-92-017, December 1992.

Beyond VOC RACT CTG Requirements, U. S. Environmental Protection Agency, Information Transfer and Program Interim Division, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, EPA-453/R-95-010, April 1995.

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Robert A. Corbitt, *Standard Handbook of Environmental Engineering*, McGraw Hill, 1989.

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